UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/046,864	01/13/2002	Steven Teig	SPLX.P0052	5504

			EXAMINER
23349	7590	10/06/2003	LIN, SUN J

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ART UNIT	PAPER NUMBER
2825	

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- *The MAILING DATE of this communication appears on the cov r sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _01/13/2002 and 4/15/2002_ .

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _27-38_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) _27-38_ is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on _04/15/2002_ is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1.   This office action is in response to application 10/046,864 and preliminary amendment concurrently filed on 01/13/2002. According to the preliminary amendment, Claims 1 – 26 are cancelled without prejudice, and new Claims 27 – 38 are added. Claims 27 – 38 remain pending in the application.

Abstract Objections

2.   Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Objections

3.   Claims are objected to because of the following informalities:

Claim 27, line 2, change "sub-region" to —**sub-regions**—.

Claim 27, line 6, in front of "traverses", insert —**of potential routes**—.

Claim 27, line 9, change "edge;" to —**edge; and**—.

Claim 27, line 10, change "costs" to —**cost**—.

Claim 29, line 5, after "set", insert —**of potential routes**—.

Claim 29, line 6, in front of "routes", insert —**potential**—.

Claim 32, line 2, in front of "traverses", insert —**of potential routes**—.

Claim 32, line 6, change "edge;" to —**edge; and**—.

Claim 33, line 2, change "sub-region" to —**sub-regions**—.

Claim 33, line 9, change "path;" to —**path; and**—.

Claim 35, line 5, after "set", insert —**of potential routes**—.

Claim 35, line 6, in front of "routes", insert —**potential**—.

Claim 38, line 6, change "path;" to —**path; and**—.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

(1).   Determining the scope and contents of the prior art.

(2).   Ascertaining the differences between the prior art and the claims at issue.

(3).   Resolving the level of ordinary skill in the pertinent art.

(4).   Considering objective evidence present in the application indicating obviousness or nonobviousness.

5.   Claims 27 – 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,295,634 to *Matsumoto* in view of U.S. Patent No. 5,587,923 to *Wang*.

6.   As to Claim 27, *Matsumoto* shows and teaches the following subject matters:

- A wiring design apparatus which automatically designs a wiring of a printed circuit substrate or a wiring between bonding pads on a semiconductor chip – [col. 1, line 12 – 18];

- Prepare *attributing elements* (i.e., *pre-computing attributes*) for wiring (i.e., *routing for nets*) process – [Steps S260, S130 in Fig. 26];

- Partitions of a _region_ of a _design layout_, containing a plurality of elements, into a plurality of _(triangular) sub-regions_, wherein a plurality of _triangulated edges_ exist between the _triangular sub-regions_ – [Fig. 7; Step S144 in Fig. 28];

- For a _first set of (triangular) sub-regions_ (e.g., _(triangular) sub-regions in the left portion of Fig. 18_), _identifying_ a first set of _wirings_ (i.e., _potential routes_) (e.g., _dashed lines connecting between pin 0, 1, 2 and 3 in the first set of (triangular) sub-regions_, wherein _each route_ in the _first set of provisional routes_ traverses the _first set of (triangular) sub-regions_ – [Fig. 18]; and

- For each _particularly selected triangular edge_ (i.e., _particular edge_), _judging_ (i.e., _identifying_) an available _capacity_, that is the _number of routes_ in the _first set of potential routes_ allow to _intersect_ the _particular triangular edge_, is exceeded (i.e., _too congestive_) – [Steps S322, S324, S326 in Fig. 34A].

Matsumoto does not teach relationship between _edge-intersect capacity_ and _edge-intersect cost_ that is dependent on the number of routes in the _first set of potential route_. But _Wang_ teaches that _edges_ with _larger (available) capacity_ have _higher probability_ of allowing _wires_ (i.e., _routes_) to go through, and _available edge capacity_ provides a _strategy in setting edge cost_ (i.e., _edge-intersect cost_) – [col. 8, line 22 – 27]. Notice that the _available capacity_ of an edge is dependent upon the number of wires (i.e., routes) that already intersect (i.e., pass) the edge. For an edge having _a **lower number of potential routes**_, its _available capacity is higher_ and its **_edge-intersect cost_** may be set to a **_lower_** value; whereas, for an edge having a **_higher number of potential routes_**, its _available capacity is lower_ and its **_edge-intersect cost_** may be set to a **_higher_** value. Therefore, the _edge-intersect cost_ of an edge is proportional to the _number of potential routes_ that intersect that edge. Notice also that the _edge-intersect cost_ is a useful parameter for estimating the _available capacity_ of an edge for use in arrangement of potential routes in order to _avoid possible congestion to the edge under study_.

Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to have used the teachings of _Wang_ to utilize

edge-intersect cost as a parameter in estimating the *available capacity* of an edge in arrangement of potential routes in order to avoid possible congestion to the edge.

Since the *edge-intersect cost* is a *useful parameter*, it is stored in a storage device for easy future retrieval of data for use in appropriately laying out the first set of potential routes for the first set of sub-region.

For reference purposes, the explanations given above in response to Claim 27 are called **[Response A]** hereinafter.

7.   As to Claim 28, as explained in **[Response A]** given above that the *edge-intersect cost* of an edge is proportional to the *number of potential route*s that intersect that edge. Setting proportional constant to be 1, we have that the *edge-intersect cost* of a particular edge equals the *number of potential route*s that intersect the particular edge.

For reference purposes, the explanations given above in response to Claim 28 are called **[Response B]** hereinafter.

8.   As to Claim 29, *Wang* teaches the subject matters in [col. 6, line 54 – 64; col. 8, line 22 – 27].

For reference purposes, the explanations given above in response to Claim 29 are called **[Response C]** hereinafter.

9.   As to Claims 30 and 31, in addition to reasons included in **[Response A]** given above, *Wang* also teaches the following subject matters – [col. 8, line 22 – 27]:

- Edges with *larger (available) capacity* have *higher probability of allowing wires to go through* ➡ *lower edge-intersect probability* ⬌ low edge-intersect cost; and
- Edges with *lower (available) capacity* have *lower probability of allowing wires to go through* ➡ *higher edge-intersect probability* ⬌ higher edge-intersect cost.

    For reference purposes, the explanations given above in response to Claims 30
and 31 are called **[Response D]** hereinafter.

10.   As to Claim 32, consider the *sub-regions in the right portion of Fig. 19* as a
second-set of sub-regions, and apply similar reasons as included in **[Response A]** given
above to the *second-set of sub-regions*.

    For reference purposes, the explanations given above in response to Claim 32
are called **[Response E]** hereinafter.

11.   Claim 33, reasons are same as that included **[Response A]** in given above and
using the following *analogical facts* between *edges*, *paths* and *routes*:

- *each route* contains *a plurality of paths*;
- *each edge* may be intersect by *one route* or *a plurality of routes*;
- *each edge* contains a *path* that is shared by *a plurality of routes*.

Applying the *analogical facts* given above, the following equivalences are true:

- path ←→ edge;
- (path-use ←→ edge-intersect) ➡ (path-use cost ←→ edge-intersect cost)

    For reference purposes, the explanations given above in response to Claim 33
are called **[Response F]** hereinafter.

12   As to Claim 34, reasons are included in **[Response F]** and **[Response B]** given
above.

13.   As to Claim 35, reasons are included in **[Response F]** and **[Response C]** given
above.

14.   As to Claims 36 and 37, reasons are included in **[Response F]** and **[Response D]**
given above.

15.   As to Claim 38, reasons are included in **[Response F]** and **[Response E]** given
above.

Conclusion

16.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sun J. Lin whose telephone number is (703) 308-4916. The examiner can normally be reached on Monday-Friday (9:00AM-6:00PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (703) 308-1323. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

Sun James Lin
Art Unit 2825
September 13, 2003

VUTHE SIEK
PRIMARY EXAMINER